

NODES

D3.4.2 Intermodality and ICT, a benchmark tool

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 SMALL OR MEDIUM-SCALE FOCUSED RESEARCH PROJECT
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Executive Summary

Building on the previous deliverable D3.41 “Intermodality and ICT Assessment Guidelines”, the present deliverable presents a set of development and benchmarking tools for interchange managers/ promoters. The benchmark tool allows to distinguish different levels of possible actions and to assess the relevance and the performance of the Information and Communication Technologies (ICT) solutions presently deployed at the level of interchanges through indicators, using the good practices presented.

Using the results of the demonstrations that will be done in the application sites (Work Package 4) and the evaluation (Work Package 5), the tools will be updated, and correctly fit in the NODES Toolbox for innovative interchange design and operation.

1. Introduction

The second deliverable of task 3.4 “Intermodality and ICT, a benchmark tool” provides interchange promoters and managers with a handbook that will allow to benchmark performance and identify the relevant tools including best practices related to the improvement of intermodal operations and information provision.

This paper builds on the previous deliverable (D3.41) which generates a better understanding on the theme and identifies the field in which the NODES tools relating to ‘Intermodality and ICT’ is situated in relation to the other four topics, which are:

- Topic 1. Strategies for integrated land use planning with urban passenger infrastructure planning.
- Topic 2. Innovative approaches relating to the design of new or upgraded efficient transport interchanges.
- Topic 4. Management and business models: the interchange as business case for the local economy and in itself.
- Topic 5. Energy efficient and environmental friendly interchanges.

The deliverable is divided into two main parts.

First, the benchmark tool and the list of performance indicators relevant to the “Intermodality and ICT” topic allow for a comprehensive assessment of an interchange. The benchmark tool and the indicators identified are divided into the four subtopics that were developed in D3.4.1. Building on this “Intermodality and ICT” self-assessment, the objective is to guide interchange stakeholders in their analysis of an existing interchange to identify areas for improvement.

Secondly, the list of tools provides solutions that address the shortcomings of interchange performance and offer good practice references to interchange managers and promoters. Those tools will be tested by the application sites in the frame of Work Package (WP) 4. Following the testing, the final set of tools will be contained in a toolbox, which through the project will become a European reference for interchange design and operation. The NODES Toolbox for innovative interchange design and operation which will ultimately be developed will allow every interchange promoter to create a more efficient, effective and inclusive urban transport system, bringing together all elements of a clean, energy-efficient, safe and intelligent transport.

2. Benchmark tool

Building on the State of the Art, Deliverable D3.41's assessment guidelines have introduced the theme and the issues related to the management of intermodality at interchanges with the help of Information and Communication Technologies together with a first benchmark tool including KPIs.

Building on this work, assessment criteria answering those issues and enabling to improve the performance of interchanges in terms of passenger information, accessibility, smart integrated ticketing and safety/security have been developed by Task 3.4 leader and participants with the help of the User Group members' comments.

The "Intermodality and ICT" benchmark tool enables local interchange stakeholders to assess the current level of performance of an interchange in terms of intermodality management through different criteria and indicators (in particular developed in WP2). It aims to help stakeholders to identify their needs and the possible solutions.

Intermodality and ICT: Data Input.		
Seamless intermodal journeys of users of the interchange. Ease to transfer from one transport mode to another.		
	Total	<i>No barriers to users' intermodal journeys at the interchange</i>
	Partial	<i>Improvable intermodal journeys at the interchange</i>
	None	<i>Existing remaining barriers to users' intermodal journeys at the interchange</i>
Multimodal static/dynamic outside information at the interchange. Information on access and exit wayfinding, structure of interchange, transport modes information, bilingual signs, etc.		
	Total	<i>Complete information enabling users to get to the intermodal node, to locate themselves and to identify the direction to the needed transport mode, etc. (existing signage, mapping, scheduling)</i>
	Partial	<i>Improvable information</i>
	None	<i>Non existent</i>

Multimodal static/dynamic inside information at the interchange. Information on schedules, fares, transport modes information, optimum routes for transfers, safety/emergency signs, bilingual signs, information desk, etc.		
	Total	<i>Complete information enabling users to orient themselves inside the interchange node (existing signage, mapping, scheduling)</i>
	Partial	<i>Improvable information</i>
	None	<i>Non existent</i>
Multimodal real-time information at the interchange. Real-Time travel. Time of departure-arrival of transport vehicles, etc.) and traffic (disruptions, etc.) information notably accessible through mobile devices (PDA, PC, smartphone (including NFC), tablet, etc.)		
	Total	<i>Complete information enabling users to adapt their journey and minimize their travel duration through updated and reliable information</i>
	Partial	<i>Improvable information</i>
	None	<i>Non existent</i>
Non-transport facilities and services Information at the interchange. Public WIFI, tourism, administration, leisure, jobs, mailbox, business, sanitary, seating, telephones, cash points, postal service, luggage lockers, retail		
	Total	<i>Complete information enabling users to make productive use of the time spent at the interchange node (when transferring from one mode to another, while passing by the interchange node, etc.)</i>
	Partial	<i>Improvable information</i>
	None	<i>Non existent</i>
Accessibility of Information at the interchange. For all users, including persons with reduced mobility (adapted symbols and pictograms, visual/spoken/tactile information, location of lifts and ramps, warning paving band, guidance listening systems, adapted ticketing facilities, etc.), tourists (bilingual signs), etc.		
	Total	<i>Adapted information enabling any user to circulate autonomously through the interchange node</i>
	Partial	<i>Improvable accessibility of information</i>
	None	<i>Information not adapted (discriminatory conditions)</i>

Accessible intermodal travels at the interchange , including for persons with reduced mobility. Adapted service frequency, vehicles equipped with wheelchair ramps, adapted ticketing and information equipment, suitable transport mode present at the interchange node		
	Total	<i>Efficient intermodal transfer enabling transport continuity for all</i>
	Partial	<i>Improvable intermodal transfer (existing barriers increasing the duration of the user journey)</i>
	None	<i>Complex intermodal transfer (existing barriers increasing the duration of the journey) r preventing users to experience a full intermodal travel)</i>
Smart integrated ticketing at the interchange . Smart integrated ticketing and fares between different transport modes/networks.		
	Total	<i>One ticketing system for all transport modes enabling the continuity of journeys (one single ticket and tariff)</i>
	Partial	<i>Some integration between transport modes/networks.</i>
	None	<i>Each mode/network has its own ticketing system.</i>
Safety and Security at the interchange . Technologies, such as video surveillance systems, of anomalous features detection (terrorism, dense crowd of people, people or thing too close of the edge of platforms, long-lasting still persons, people stepping over the barriers, network saturation, etc.) for public security and safety at the interchange node		
	Total	<i>Safety and security efficiently provided at the interchange, notably through the use of technological control systems enabling to limit incidents and accidents and favour seamless journeys</i>
	Partial	<i>Improvable safety and security (perceived insecurity included) at the interchange, , notably through the use of technological control systems enabling to limit incidents and accidents and favour seamless journeys</i>
	None	<i>Limited safety and security efforts provided to mitigate incidents and accidents and favour seamless journeys at the interchange</i>

The following KPIs have been identified in the framework of the project (in particular within WP2, WP3 and WP5) to be used to evaluate the relevance of the different tools presented below. It is important to note that this does not prevent other KPIs to be added as the project evolves.

KPI – Interchange intermodality

Performance indicator name	Interchange intermodality
Performance indicator definition	Modes / services at interchange area
Measurement unit	Number of modes / services
Method of measurement	Direct measurement / observation
Frequency of measurement	Once
Target group for measurement	Interchange manager / promoter
Domain for measurement	Interchange area
Relevant tools	1, 2, 3

KPI – Ease of intermodal transfer

Performance indicator name	Ease of intermodal transfer
Performance indicator definition	Transfer times & way finding between used (connecting) modes
Measurement unit	Distance (metres), time (minutes)
Method of measurement	Survey
Frequency of measurement	Once
Target group for measurement	End users
Domain for measurement	Interchange area
Relevant tools	1, 2, 3

KPI – Seamless travelling

Performance indicator name	Seamless travelling
Performance indicator definition	Walking distances between different modes feeding interchange
Measurement unit	Distance (metres), time (minutes)
Method of measurement	Direct measurement / observation
Frequency of measurement	Once
Target group for measurement	Interchange manager / promoter
Domain for measurement	Interchange area
Relevant tools	1, 2, 3

KPI – Interchange capacity within interchange area

Performance indicator name	Interchange capacity within interchange area
Performance indicator definition	Stations / stops at interchange area
Measurement unit	Number of stations / stops at interchange area
Method of measurement	Direct measurement / observation
Frequency of measurement	Once
Target group for measurement	Local Authorities / PT operators
Domain for measurement	Interchange area
Relevant tools	1, 2, 3

KPI – Interchange capacity in the surrounding area of interchange

Performance indicator name	Interchange capacity in the surrounding area of interchange
Performance indicator definition	Stations / stops at interchange area
Measurement unit	Number of stations / stops in the surrounding area of interchange
Method of measurement	Direct measurement / observation
Frequency of measurement	Once
Target group for measurement	Local Authorities / PT operators
Domain for measurement	Interchange area
Relevant tools	1, 2, 3

KPI – Interchange capacity of mode services

Performance indicator name	Interchange capacity of mode services
Performance indicator definition	Number of services (lines per mode)
Measurement unit	Number of services that can be operated simultaneously
Method of measurement	Collection from relevant records / plans
Frequency of measurement	Once
Target group for measurement	Interchange manager / promoter
Domain for measurement	Interchange area
Relevant tools	1, 2, 3

KPI – Frequency of services

Performance indicator name	Frequency of services
Performance indicator definition	Compactness of the services at the interchange area
Measurement unit	Rate between the total kilometers of all lines and the total network length
Method of measurement	Survey
Frequency of measurement	Before / After
Target group for measurement	Local Authorities / PT operators
Domain for measurement	Interchange area
Relevant tools	1, 2, 3

KPI – Passenger/non-passenger demand

Performance indicator name	Passenger / non-passenger demand
Performance indicator definition	Passengers / non-passengers using the interchange
Measurement unit	Passengers / non-passengers using the interchange (per day, month, year)
Method of measurement	Survey
Frequency of measurement	Before / After
Target group for measurement	Interchange manager / promoter
Domain for measurement	Interchange area
Relevant tools	1, 2, 3

KPI – Availability to connecting modes

Performance indicator name	Availability to connecting modes
Performance indicator definition	Focus on smooth and flexibility for the whole journey
Measurement unit	Number of connecting modes
Method of measurement	Direct measurement / observation
Frequency of measurement	Once
Target group for measurement	Local Authorities / PT operators
Domain for measurement	Interchange area
Relevant tools	1, 2, 3

KPI – Administrative integration of transport modes

Performance indicator name	Administrative integration of transport modes
Performance indicator definition	Management, image and Information about the public transportation system
Measurement unit	Existence of management, image and Information measures
Method of measurement	Survey (interviews)
Frequency of measurement	Before / After
Target group for measurement	Interchange manager / promoter
Domain for measurement	Interchange area
Relevant tools	1, 2, 3

KPI – Multimodal Information

Performance indicator name	Availability of information for connecting with other PT modes/means of transport
Performance indicator definition	Multimodal information (incl. service disruptions and emergency info) according to user needs
Measurement unit	Existence of multimodal information (incl. service disruptions and emergency info) according to user needs
Method of measurement	Survey
Frequency of measurement	Before / After
Target group for measurement	Interchange manager / promoter
Domain for measurement	Interchange area
Relevant tools	4, 5, 6, 7, 8, 9, 10

KPI – Static information

Performance indicator name	Availability of static information
Performance indicator definition	Static information (signage, mapping, scheduling ; e.g. board, advertising column)
Measurement unit	Existence of static information (signage, mapping, scheduling ; e.g. board, advertising column)
Method of measurement	Survey
Frequency of measurement	Before / After
Target group for measurement	Interchange manager / promoter
Domain for measurement	Interchange area
Relevant tools	4, 5, 6, 7, 8, 9, 10

KPI – Destination Information

Performance indicator name	Availability of destination information
Performance indicator definition	Destination information (e.g. hotels, sights, events)
Measurement unit	Existence of destination information (e.g. hotels, sights, events)
Method of measurement	Survey
Frequency of measurement	Before / After
Target group for measurement	Interchange manager / promoter
Domain for measurement	Interchange area
Relevant tools	4, 5, 6, 7, 8, 9, 10

KPI – Non-transport information

Performance indicator name	Availability of non-transport information
Performance indicator definition	Non-transport information (public Wi-Fi, tourism, administration, leisure, jobs, mailbox, business, sanitary, seating, telephones, cash points, postal service, luggage lockers, retail)
Measurement unit	Existence of non-transport information (public Wi-Fi, tourism, administration, leisure, jobs, mailbox, business, sanitary, seating, telephones, cash points, postal service, luggage lockers, retail)
Method of measurement	Survey
Frequency of measurement	Before / After
Target group for measurement	Interchange manager / promoter
Domain for measurement	Interchange area
Relevant tools	4, 5, 6, 7, 8, 9, 10

KPI – Geographic Information

Performance indicator name	Availability of geographic information
Performance indicator definition	Geographic information at the interchange (location of the interchange in the city, location of users at the interchange, location of facilities and services)
Measurement unit	Existence of geographic information at the interchange (location of the interchange in the city, location of users at the interchange, location of facilities and services)
Method of measurement	Survey
Frequency of measurement	Before / After
Target group for measurement	Interchange manager / promoter
Domain for measurement	Interchange area
Relevant tools	4, 5, 6, 7, 8, 9, 10

KPI – Bilingual signs

Performance indicator name	Availability of bilingual signs
Performance indicator definition	Bilingual signs at the interchange
Measurement unit	Existence of bilingual signs at the interchange
Method of measurement	Survey
Frequency of measurement	Before / After
Target group for measurement	Interchange manager / promoter
Domain for measurement	Interchange area
Relevant tools	4, 5, 6, 7, 8, 9, 10

KPI – Emergency signs

Performance indicator name	Availability of emergency signs
Performance indicator definition	Emergency signs at the interchange
Measurement unit	Existence of bilingual signs at the interchange
Method of measurement	Survey
Frequency of measurement	Before / After
Target group for measurement	Interchange manager / promoter
Domain for measurement	Interchange area
Relevant tools	4, 5, 6, 7, 8, 9, 10

KPI – Information desk

Performance indicator name	Availability of information desk (human presence)
Performance indicator definition	Information desk (human presence at the interchange)
Measurement unit	Existence of information desk (human presence at the interchange)
Method of measurement	Survey
Frequency of measurement	Before / After
Target group for measurement	Interchange manager / promoter
Domain for measurement	Interchange area
Relevant tools	4, 5, 6, 7, 8, 9, 10

KPI – Real-Time Information

Performance indicator name	Availability of real-time information
Performance indicator definition	Real-time information (theoretical time removed from the display after each departure through an update, indication of waiting time before next mode arrival time, information on disruptions and incidents, etc.)
Measurement unit	Existence of real-time information (theoretical time removed from the display after each departure through an update, indication of waiting time before next mode arrival time, information on disruptions and incidents, etc.)
Method of measurement	Survey
Frequency of measurement	Before / After
Target group for measurement	Interchange manager / promoter
Domain for measurement	Interchange area
Relevant tools	4, 5, 6, 7, 8, 9, 10

KPI – Near Field Communication solutions

Performance indicator name	Near Field Communication solutions at interchange
Performance indicator definition	Availability of Near Field Communication solutions at interchange accessible using the mobile device as a transport ticket
Measurement unit	Existence of Near Field Communication solutions at interchange accessible using the mobile device as a transport ticket
Method of measurement	Survey
Frequency of measurement	Once
Target group for measurement	Interchange manager / promoter
Domain for measurement	Network level
Relevant tools	4, 5, 6, 7, 8, 9, 10

KPI – Information/Services accessible through mobile devices

Performance indicator name	Availability of information/services accessible through mobile devices
Performance indicator definition	Information/services accessible through mobile devices (PDA, PC, smartphone, tablet, etc.)
Measurement unit	Existence of information/services available through mobile devices (PDA, PC, smartphone, tablet, etc.) (online information and/or purchase, mobile application)
Method of measurement	Survey
Frequency of measurement	Before / After
Target group for measurement	Local Authorities / PT operators
Domain for measurement	Network level
Relevant tools	4, 5, 6, 7, 8, 9, 10

KPI – Information Systems

Performance indicator name	Availability of information systems
Performance indicator definition	Information systems (Geographic Information System Service, Management and Information System, Multimodal Information System, etc.)
Measurement unit	Existence of information systems (Geographic Information System Service, Management and Information System,, Multimodal Information System, etc.)
Method of measurement	Survey
Frequency of measurement	Before / After
Target group for measurement	Local Authorities / PT operators
Domain for measurement	Network level
Relevant tools	4, 5, 6, 7, 8, 9, 10

KPI – Indoor/Outdoor coverage

Performance indicator name	Availability of indoor/outdoor coverage (GPS/WIFI/3G/4G)
Performance indicator definition	Indoor / outdoor coverage (GPS/WIFI/3G/4G)
Measurement unit	Existence of indoor / outdoor coverage (GPS/WIFI/3G/4G)
Method of measurement	Survey
Frequency of measurement	Before / After
Target group for measurement	Interchange manager / promoter
Domain for measurement	Interchange area
Relevant tools	4, 5, 6, 7, 8, 9, 10

KPI – Availability of information

Performance indicator name	Availability of information (also include quality of information)
Performance indicator definition	Existing of information tools (signing, screens, announcements, static info)
Measurement unit	Qualitative (Yes / No)
Method of measurement	Direct measurement / observation
Frequency of measurement	Once
Target group for measurement	Interchange manager / promoter
Domain for measurement	Interchange area
Relevant tools	4, 5, 6, 7, 8, 9, 10

KPI – Availability of public WIFI

Performance indicator name	Availability of public WIFI (for now it is part of experience, however once customers get more used to the availability of WIFI, this indicator may not be relevant)
Performance indicator definition	Existence of wireless access points (within and around the interchange)
Measurement unit	Qualitative (Yes / No)
Method of measurement	Direct measurement / observation
Frequency of measurement	Once
Target group for measurement	Interchange manager / promoter
Domain for measurement	Interchange area
Relevant tools	4, 5, 6, 7, 8, 9, 10

KPI – Availability of information and signing

Performance indicator name	Availability of information and signing
Performance indicator definition	Existence of information and signing
Measurement unit	Qualitative (Yes / No)
Method of measurement	Direct measurement/observation
Frequency of measurement	Once
Target group for measurement	Interchange manager / promoter
Domain for measurement	Interchange area
Relevant tools	4, 5, 6, 7, 8, 9, 10

KPI – Staff training

Performance indicator name	Staff training
Performance indicator definition	Existence of theoretical & practical awareness training
Measurement unit	Qualitative (Yes / No)
Method of measurement	Direct measurement / observation
Frequency of measurement	Once
Target group for measurement	Interchange manager / promoter
Domain for measurement	Interchange area
Relevant tools	4, 5, 6, 7, 8, 9, 10

KPI – Staff availability

Performance indicator name	Staff availability
Performance indicator definition	Staff are available to provide pre-trip information, to help passengers
Measurement unit	Level of customer satisfaction (e.g. on a scale of 1-5)
Method of measurement	Survey
Frequency of measurement	Before / After
Target group for measurement	End users
Domain for measurement	Interchange area
Relevant tools	4, 5, 6, 7, 8, 9, 10

KPI – Customer care assistance

Performance indicator name	Customer care assistance
Performance indicator definition	Assistance at service interruptions, for customers needing help, etc.
Measurement unit	Level of customer satisfaction (e.g. on a scale of 1-5)
Method of measurement	Survey
Frequency of measurement	Before / After
Target group for measurement	End users
Domain for measurement	Interchange area
Relevant tools	4, 5, 6, 7, 8, 9, 10

KPI – Information accessible to PRM

Performance indicator name	Availability of information accessible to PRM
Performance indicator definition	Information accessible to PRM: acoustic signal, maps/information in Braille, non-reflecting/high-contrast information (text, images), etc.
Measurement unit	Existence of information accessible to PRM: acoustic signal, maps/information in Braille, non-reflecting/high-contrast information (text, images), etc.
Method of measurement	Survey
Frequency of measurement	Before / After
Target group for measurement	Interchange manager / promoter
Domain for measurement	Interchange area
Relevant tools	11, 12, 13, 14, 15, 16, 17

KPI – Guidance / wayfinding technological solutions for PRM

Performance indicator name	Availability of guidance/wayfinding technological solutions useful, notably for PRM
Performance indicator definition	Guidance/wayfinding technological solutions useful for PRM (assistive guidance / listening systems, personal assistants (VAS), TTY, interactive totems, etc.)
Measurement unit	Existence of guidance/wayfinding technological solutions useful for PRM (assistive guidance / listening systems, personal assistants (VAS), TTY, interactive totems, etc.)
Method of measurement	Survey
Frequency of measurement	Before / After
Target group for measurement	Local Authorities / PT operators
Domain for measurement	Interchange area
Relevant tools	11, 12, 13, 14, 15, 16, 17

KPI – Availability of dedicated public transport services for PRM

Performance indicator name	Availability of dedicated public transport services for PRM
Performance indicator definition	Existence of a public transport service specifically aimed at PRM
Measurement unit	Qualitative (Yes / No)
Method of measurement	Survey
Frequency of measurement	Once
Target group for measurement	Interchange manager / promoter
Domain for measurement	Interchange area
Relevant tools	11, 12, 13, 14, 15, 16, 17

KPI – Accessibility of ticketing services to PRM

Performance indicator name	Accessibility of ticketing services to PRM
Performance indicator definition	Ease of buying and validating tickets for PRM
Measurement unit	Perceived quality / easiness of ticketing services
Method of measurement	Survey
Frequency of measurement	Before / After
Target group for measurement	End users
Domain for measurement	Interchange area
Relevant tools	11, 12, 13, 14, 15, 16, 17

KPI – Presence of facilities enhancing accessibility

Performance indicator name	Availability of facilities enhancing accessibility at the interchange
Performance indicator definition	Availability of facilities enhancing accessibility at the interchange (presence of lifts / escalators / moving walkways, etc.)
Measurement unit	Existence of facilities enhancing accessibility at the interchange (presence of lifts / escalators / moving walkways, etc.)
Method of measurement	Direct observation
Frequency of measurement	Once
Target group for measurement	Interchange manager / promoter
Domain for measurement	Interchange area
Relevant tools	11, 12, 13, 14, 15, 16, 17

KPI – Easy to use for older and disabled people

Performance indicator name	Easy to use for older and disabled people
Performance indicator definition	Existence of measures & assistance to guide through security systems
Measurement unit	Qualitative (Yes / No)
Method of measurement	Survey
Frequency of measurement	Before/After
Target group for measurement	End users
Domain for measurement	Interchange area
Relevant tools	11, 12, 13, 14, 15, 16, 17

KPI – Complaint procedures (especially for older and disabled people)

Performance indicator name	Complaint procedures applied to improve services for all customers (especially for older and disabled people)
Performance indicator definition	Existence of complaint procedures
Measurement unit	Qualitative (Yes / No)
Method of measurement	Survey
Frequency of measurement	Once
Target group for measurement	Interchange manager / promoter
Domain for measurement	Interchange area
Relevant tools	11, 12, 13, 14, 15, 16, 17

KPI – Integrated ticketing

Performance indicator name	Integrated ticketing
Performance indicator definition	Availability of integrated ticketing
Measurement unit	Existence of integrated fares
Method of measurement	Survey
Frequency of measurement	Once
Target group for measurement	Interchange manager / promoter
Domain for measurement	Network level
Relevant tools	18, 19, 20, 21, 22

KPI – Integrated media for ticketing/payment

Performance indicator name	Integrated media for ticketing / payment
Performance indicator definition	Availability of integrated media for ticketing / payment
Measurement unit	Existence of common media / ticket between transport operators / networks
Method of measurement	Survey
Frequency of measurement	Once
Target group for measurement	Interchange manager / promoter
Domain for measurement	Network level
Relevant tools	18, 19, 20, 21, 22

KPI – Common ticketing distribution channel

Performance indicator name	Common ticketing distribution channel
Performance indicator definition	Availability of common point of sale or common distribution policy
Measurement unit	Existence of common point of sale or common distribution policy
Method of measurement	Survey
Frequency of measurement	Once
Target group for measurement	Interchange manager / promoter
Domain for measurement	Network level
Relevant tools	18, 19, 20, 21, 22

KPI – Pricing integration of transport modes

Performance indicator name	Pricing integration of transport modes
Performance indicator definition	Pricing framework and multi-trip tickets
Measurement unit	Existence of pricing framework and multi-trip tickets
Method of measurement	Survey
Frequency of measurement	Once
Target group for measurement	Interchange manager / promoter
Domain for measurement	Network level
Relevant tools	18, 19, 20, 21, 22

KPI – Interoperable systems

Performance indicator name	Interoperable systems enabling integrated fares
Performance indicator definition	Availability of interoperable systems enabling integrated fares
Measurement unit	Existence of interoperable systems enabling integrated fares
Method of measurement	Survey
Frequency of measurement	Once
Target group for measurement	Interchange manager / promoter
Domain for measurement	Network level
Relevant tools	18, 19, 20, 21, 22

KPI – Reliability of public transport service

Performance indicator name	Reliability of public transport service
Performance indicator definition	Reliability of public transport service
Measurement unit	System availability rate
Method of measurement	Direct Observation
Frequency of measurement	Before / After
Target group for measurement	Interchange manager / promoter
Domain for measurement	Interchange area
Relevant tools	18, 19, 20, 21, 22

KPI – Availability of smart ticketing at interchange

Performance indicator name	Availability of smart ticketing at interchange
Performance indicator definition	Existence of smart ticketing at interchange
Measurement unit	Qualitative (Yes / No)
Method of measurement	Survey
Frequency of measurement	Once
Target group for measurement	Local Authorities / PT operators
Domain for measurement	Interchange area
Relevant tools	18, 19, 20, 21, 22

KPI – Operational safety technology

Performance indicator name	Operational safety technology
Performance indicator definition	Provision of technology (e.g. surveillance systems, security by design - lighting, clear lines of sight...)
Measurement unit	Level of customer satisfaction (e.g. on a scale of 1-5)
Method of measurement	Survey
Frequency of measurement	Before / After
Target group for measurement	End users
Domain for measurement	Interchange area
Relevant tools	23, 24

KPI – Control systems

Performance indicator name	Availability of control systems
Performance indicator definition	Availability of control systems (e.g. security cameras, emergency alarm, fire protection, etc.)
Measurement unit	Existence of control systems (e.g. security cameras, emergency alarm, fire protection, etc.)
Method of measurement	Direct Observation
Frequency of measurement	Once
Target group for measurement	Interchange manager / promoter
Domain for measurement	Interchange area
Relevant tools	23, 24

KPI – Perceived security

Performance indicator name	Perceived security at interchange
Performance indicator definition	Users' feeling of security at interchange (when waiting for the next departure, when transferring from one transport mode to another, etc.)
Measurement unit	Level of customer satisfaction (e.g. on a scale of 1-5)
Method of measurement	Survey
Frequency of measurement	Before / After
Target group for measurement	End users
Domain for measurement	Interchange area
Relevant tools	23, 24

3. Tools

Task 3.4 “Intermodality and ICT” list of tools has been developed on the basis of the first deliverable which outlined the theme of management of intermodality at interchanges through the use of ICT, as well as the feedback received from the User Group consultation and several exchanges with task 3.4 participants.

The list was eventually shortened into **24 tools** which offer a comprehensive overview of the possible solutions to improve interchange performance in the field of “Intermodality and ICT” (aimed at interchanges’ managers / promoters and for the benefit of the interchange user). The overlaps with the other topics were also taken into consideration when finalising the tools list.

The tools were split into the following subtopics.

- Passenger information for facilitated multimodal travels;
- ICT-based technologies for an increased accessibility at interchanges;
- Smart and integrated ticketing for a strengthened intermodality; and
- Innovative solutions for safe and secure intermodal journeys at interchanges.

Using the results of the demonstration that will be done in the applications sites (WP4) and the evaluation (WP5) the tools will be updated and correctly fit in the NODES Toolbox.

The tools should help stakeholders to improve their interchange performance, based on the evaluation included in the benchmark tool.

In order to better understand each tool, they can be grouped according to tool type. The following seven types have been identified:

Tool type:

C: Cultural/ social approach

L: Legislative/ regulatory

F: Economic/ financial

O: Organisational

T: Technical (software, technology)

M: Methodological (Method, Strategy, planning)

N: New materials

Strategic evaluation objectives:

1. Enhance accessibility and integration
2. Enhance intermodality
3. Enhance liveability
4. Increase safety and security conditions
5. Increase economic viability and costs efficiency
6. Stimulate local economy
7. Increase environmental efficiency
8. Increase energy efficiency

N°	Tool title	Tool description	Tool type	Reference/ Good practice	Strategic objectives
Intermodality					
1	Customer charter for seamless travels at interchanges	Customer charter guarantying the continuity of services at interchanges.	M/O		1, 2, 3
2	Intermodal Transport Control System (ITCS)	A management tool enabling fast, attractive and reliable intermodal information for interchanges managers so they can provide users with more efficient transport services.	T/M		1, 2, 4
3	Operation Control Center (OCC)	A room serving as a central space where a large physical facility or physically dispersed transport service can be monitored, evaluated, analysed and actions taken such as handling travel and traffic disruptions and responding to emergencies.	T/M		1, 2, 4
Passenger Information					
4	Human individualized information/orientation service to interchange users	Development of a human individualized support service (information, orientation) to interchange users consisting in trained interchange staff competent to inform and to guide users at the interchange.	O/C		1, 2, 3, 4

N°	Tool title	Tool description	Tool type	Reference/ Good practice	Strategic objectives
5	Multimodal journey planner	A multimodal journey planner is a service based on a system enabling to provide travellers with an itinerary for an intermodal passenger transport journey. The system can provide timetable, routing and other travel information. A single journey may use a sequence of several modes of transport, meaning that the system must know about different public transport services available (bus, tram, metro, train, aerotram, plane, carsharing, carpooling, bikesharing, etc.) and about transportation networks (roads, footpaths, cycle routes) for private transportation automobile, walking, bicycle).	T/O	<p>A key service for Authority to promote Public Transport. Already existing in main cities.</p> <p>Tisséo (Toulouse) multimodal journey planner : http://www.tisseo.fr/calculateur-multimodal</p> <p>Existing in Rome: ATAC website and mobile application</p>	
6	Static/dynamic multimodal map of an interchange	Development of a static/dynamic interchange multimodal interactive map (2D/3D), enabling users to get transport networks' information (stop points, routes, next departures, disruptions, etc.) and to visualize the interchange outdoor environment. Possible e visualisation/cartography of the different levels of services existing at the interchange.	T/O	<p>More common to find static maps than "dynamic" maps (still lacking).</p> <p>Tisséo (Toulouse) interactive map: http://www.tisseo.fr/plan-interactif/</p> <p>Existing maps of interchanges available on the PTA/PTO website in Lyon (France)</p> <p>Static maps existing in Milan at the entry of the interchange</p> <p>Existing in Japan</p> <p>In France: Partially deployed public transport networks. Just few stations offer 3D maps. Digital shield providing: connections, next departures or disruption are more and more usually now. There are various infokiosks at interchanges in various countries (at airports, railway stations etc)</p>	1, 2, 3, 4

N°	Tool title	Tool description	Tool type	Reference/ Good practice	Strategic objectives
7	Real-time multimodal passenger information at interchanges	Development of a real-time multimodal passenger information at interchanges (including static and disruptions information) through dynamic panels (totems) / station displays / mobile application/NFC solutions		<p>In Milan, Milan Malpensa Airport flights' times are available at Milan Cadorna railway station.</p> <p>In Belgium, railtime is the most used but only on trains, in Brussels as well, not in Flanders</p>	1, 2
	Mobile application for users' guidance at interchanges (indoor/outdoor)	Development of a mobile application providing a guidance service to users within the interchange area and public transport networks, available indoor and outdoor using 2-D representations.	T/O	<p>Existing.</p> <p>In Rouen, such an application exists but improvements are necessary. Indeed, a guidance mobile application is already available regarding the public transport network in Rouen (Astuce) but it doesn't cover accessibility issues.</p> <p>Mobile application to be based on public transport networks multimodal journey planners, such as Astuce network (Rouen) multimodal journey planner: http://www.crea-astuce.fr/</p> <p>Indoor mobile application: Not existing yet in the public transport sector. Not relevant/feasible in all cities/interchanges.</p> <p>Various indoor navigation applications and systems (GPS, WLAN, RFID, Infrared, Ultrasound, Bluetooth, etc.) have been developed for the location of users and the planning of paths.</p> <p>Today over 10 000 floor plans are available within the "Google Application" including airports, transit stations or railway stations all over the world.</p>	1, 2, 4, 6

N°	Tool title	Tool description	Tool type	Reference/ Good practice	Strategic objectives
9	Passenger information at interchanges through a mobile application using users' feedbacks (crowdsourcing)	Social media solution / mobile application using users' feedbacks (crowdsourcing) for more reliable passenger information at interchanges	T/O/C	Not existing yet in the public transport sector. Crowdsourcing application for Thessaloniki Public Transport System at http://bybus.gr/en/index.php Inspiration: "Waze" mobile application	
10	Way-finding guidelines/Passenger information Master Plan for interchanges stakeholders	Development of a "travel information" data sheet / identification form, to be used as a coordination/cooperation tool by local interchange stakeholders when building or refurbishing an interchange, indicating the graphic references the most relevant and commonly accepted worldwide (symbols, colours, sizes and text fonts) in order to unify travel information signage, notably at European level.	M/O	To be developed. Different signalling manuals exist, but each has its own design based on the participants in the process, various manuals even in the same city.	
Accessibility					
11	Signage strategy for users' orientation within an interchange	Wayfinding through named destination signage at interchanges, the use of international pictograms, etc.	T/O	Existing but customisation needed.	
12	Signage at interchanges adapted to communication-impaired people (notably cognitive impaired), non-native and illiterate individuals	Development of symbols adapted to mental/cognitive-impaired people, non-native and illiterate individuals at the interchange with the objective to improve the autonomy of such users.	M/O	Existing in Mexico City. http://www.metro.df.gob.mx/red/iconografia.html	1, 2, 3, 4

N°	Tool title	Tool description	Tool type	Reference/ Good practice	Strategic objectives
13	Passenger (PRM) information and guidance through a system of audio-description of the interchange area	Development of theoretical audio-description of the interchange area enabling visually-impaired users to orient themselves. (A device able to locate indoor people is key for a technical solution. State of the art is still experimental).	T/O	Existing in Toulouse (Tisséo), Reading (pilot) and Merseytravel, UK http://www.merseytravel.gov.uk/travelling-around/transport-accessibility/Pages/Audio-Guides.aspx Existing advanced system in Prague	1, 2, 3, 4
14	Passenger information aimed at hearing impaired interchange users through the a system of visioconference providing translation in sign language	Development of a translation service in sign language aimed at hearing impaired interchange users through by a system of visioconference functioning with a call center and trained staff. (Call center or trained staff with skilled people may be rise the cost of such a service).	T/O		1, 2, 3, 4
15	Accessibility Master Plan / guidelines for interchanges	Accessibility guidelines aimed at interchange stakeholders to consider PRM issues when building or refurbishing one interchange.	M/O	Existing at Ministry of transport UK: "Accessible train station design for disabled people: A code of practice" https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/3191/accessible-train-station-design-cop.pdf	1, 5
16	ICT applications/services and adapted equipment/facilities assessment by people with reduced mobility at interchanges through consultation of PRM associations	Consultation of PRM associations to assess ICT applications/services and to consider and make coherent measures based on ICT at interchanges towards the different types of disability - through accessibility comities, focus groups, etc.	M/O	Existing in Toulouse ("CARUT" / Tisséo), Rome and Reading (Reading Borough Council Access Forum) but improvements needed.	1, 2, 3, 4, 5

N°	Tool title	Tool description	Tool type	Reference/ Good practice	Strategic objectives
17	Technical Specification of Interoperability (TSI) relating to 'persons with reduced mobility' at interchanges	Technical specification of interoperability (TSI) relating to 'persons with reduced mobility' covers the aspect of "Accessibility for Persons with Reduced Mobility" for the Infrastructure, the Rolling Stock and, to a minor extent, the Telematics Applications for Passenger subsystems.	L/T	Existing. Decision 2008/164/EC (21 Dec 2007) amended by Decision 2012/464/EU (23 Jul 12)	1, 2, 3, 4, 5
Smart and integrated ticketing					
18	Transport integrated fares for seamless travels at interchanges	Establishment of transport multi-modal tariffs and multi-trip tickets to enable passengers to use different forms of transport with the same ticket, implying the implementation of an integrated fare system (back office).	T/O/F	Many transport networks have provided users with one transport ticket/smart card giving access to different transport modes and sometime transport networks (Oyster (London), Navigo (Paris), Pastel (Toulouse), etc.). http://www.navigo.fr/navigo-la-solution-mobilite-des-voyageurs-en-ile-de-france.html http://www.tisseo.fr/les-tarifs/obtenir-une-carte-pastel http://www.tfl.gov.uk/tickets/14836.aspx	1, 2, 3, 5
19	Interoperable transport smart ticketing system for seamless travels at interchanges	Development of an interoperable smart ticketing system enabling authority/operator to provide users with compatible transport tickets / a unique transport ticket so they can use the different transport modes (ideally transport networks) present at the interchange.	T/O/M	Many transport networks have adapted their ticketing system to make it interoperable with other transport networks' systems.	1, 2, 3, 4, 5, 6, 7
20	Integrated ticketing assessment form for interchanges stakeholders	Assessment form based on the interchange showing degree to which integrated tickets are available and for what categories of journey / passengers.	M/T	Existing in Reading. To be developed in a usable format.	1, 2

N°	Tool title	Tool description	Tool type	Reference/ Good practice	Strategic objectives
21	Transport tickets (from different transport networks) physical point-of-sale/ One-stop-shop	A unique point-of-sale / one-stop-shop at one interchange where users can purchase transport tickets whatever the transport mode (available at the interchange) and the transport network (authority/operator) is.	O/C		1, 2, 3, 5
22	Transport tickets virtual point of sale (web, mobile, etc.)	Purchase/renew/top up of transport tickets through various virtual ways (ideally from any transport network present at the interchange) by interchanges users	T/O/F	Oyster card (London): https://oyster.tfl.gov.uk/oyster/link/sso/0001.do o Navigo card (Paris): https://rechargercommandernavigo.fr/962b56fa-b455-11e1b5b5-000c29fc784d/content.prepareHome.do	1, 2, 3, 5, 7

N°	Tool title	Tool description	Tool type	Reference/ Good practice	Strategic objectives
Security / Safety					
	Interchange security and safety management though users feedback (crowdsourcing)	Development of a webpage/platform/mobile application/social media where volunteer users provide feedback (crowdsourcing) on the level of quality/safety-security perceived at interchanges as a decision support tool for interchange managers	T/O/M	<p>“ENERQI” European project (IEE funding)</p> <p>Existing mobile application in Toulouse, managed by the city of Toulouse, enabling the public transport users to give feedback on the general state of the interchange that contributes to the security perceived at the interchange.</p> <p>Existing in Rome: possible from ATAC website. There is a dedicated area where users can fill in assessment forms, including forms concerning safety and security. In this way, managers can use these feedbacks as a decision supporting tool.</p>	1, 2, 3, 4, 5
24	Assessment tool – Secure Stations Scheme, design and management audit for interchanges stakeholders	Secure Stations Scheme design and management audit allowing operators to assess their stations secure status. The audit document enables gaps in security or other issues relating to the safety and security of passengers and staff at the station to be identified.	M/T	<p>Existing in the UK Department for Transport. Department for Transport Secure Stations Scheme www.gov.uk/secure-stations-scheme-accreditation-for-rail-operators</p> <p>Existing in Rome: The ATAC security department compiles assessment forms and periodical reports describing risks for passengers and staff</p>	4

N°	Tool title	Tool description	Tool type	Reference/ Good practice	Strategic objectives
EU projects					
	MEDIATE	Methodology for Describing the Accessibility of Transport in Europe (MEDIATE)		http://www.mediate-project.eu/	
	OASIS	Open architecture for Accessible Services Integration and Standardization (OASIS) (Quality of life for the elderly with the help of ICTs)		http://www.oasis-project.eu/	
	NICHE+	Builds on NICHE project (New and Innovative Concepts for Helping European Transport Sustainability) and promotes promote innovative measures for making urban transport more efficient and sustainable and to move them from their current "niche" position into a mainstream urban transport application		http://www.niches-transport.org/	
	KITE	A knowledge base for intermodal passenger travel in Europe (KITE)		http://www.kite-project.eu/	
	MIMIC	Mobility, intermodality and interchanges (MIMIC)		http://www.transport-research.info/web/projects/project_details.cfm?ID=523	
	PIRATE	Promoting Interchange Rationale, Accessibility and Transfer Efficiency (PIRATE)		http://www.transport-research.info/web/projects/project_details.cfm?id=593	
	SWITCH	Sustainable workable intermodal transport choices (SWITCH)		http://www.transport-research.info/web/projects/project_details.cfm?id=743	
	CITY-HUB	Contributing to the design and operation of seamless, smart, clean and safe intermodal public transport systems, while ensuring that “vulnerable” target groups, i.e. the elderly, youth, physically and mentally handicapped people can adequately benefit from these interchanges.		http://www.cityhub-project.eu/	

N°	Tool title	Tool description	Tool type	Reference/ Good practice	Strategic objectives
	ORIGAMI	Improving long-distance door-to-door passenger transport chains through improved co-modality and intermodality.		http://www.origami-project.eu/	
	Synaptic	Synergy of New Advanced Public Transport Solutions Improving Connectivity in North-West Europe (Synaptic)		http://www.synaptic-mobility.eu/	
	CIVITAS Initiative	Promotes sustainable mobility solutions in Europe		http://www.civitas-initiative.org/	

4. Conclusions

Building on the tools listed above, the WP3 benchmark tool will allow interchange managers/promoters to distinguish different levels of possible actions and to assess the relevance and the performance of the Information and Communication Technologies (ICT) solutions presently deployed at the level of interchange nodes through indicators. Using the results of the demonstration that will be done in the application sites (WP4) and the evaluation (WP5), the tools will be updated, and correctly fit in the NODES Toolbox for innovative interchange design and operation.

5. Used resources and publications

Le Centre d'études sur les réseaux, les transports, l'urbanisme et les constructions publiques (CERTU) - *Handicaps et Usages* - October 2013

GSMA - *White Paper: Mobile NFC in Transport* - September 2012

International Association of Public Transport (UITP), *Secure Public Transport in a Changeable World*, November 2010

Urban ITS Expert Group – *Best practices in Urban ITS Collection* – Collection of Projects – January 2013

COMMISSION DECISION of 21 December 2007 concerning the technical specification of interoperability relating to 'persons with reduced mobility' in the trans-European conventional and high-speed rail system (2008/164/EC)

DIRECTIVE 2010/40/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 7 July 2010 on the framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport

European regulation text (EUR-LEX) Decision and Decision 2012/464/EU amending Decision 2008/164/EC

<http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1398330518250&uri=CELEX:32008D0164>

ERA-document with references to the applicable standards (mandatory and voluntary) used in the PRM-TSI

http://www.era.europa.eu/Document-Register/Documents/IOU-stnd-20081113-%20TV%20PRM_v1.pdf

Designer RUEDI BAUR website: <http://new.ruedi-baur.eu/>

Designer Paul Mijksenaar website: www.mijksenaar.com

Design For All Foundation website: <http://www.designforall.org>

American Institute of Graphic Arts (AIGA) website: <http://www.aiga.org>

Designer Lance WYMAN website: <http://www.lancewyman.com/>

Disability Action Plan 2012/2017 - <http://www.transport.nsw.gov.au/content/transport-nsw-disability-action-plan-2012-2017>